

DISCUSSION OF THE AMENDMENT

Claims 1-22 are active in the present application. Independent Claim 1 is amended for clarity. Claims 21-22 are new claims. Support for new Claim 21 is found on page 3, line 14. Support for new Claim 22 is found on page 3, line 23.

The specification is amended for clarity to correct a typographical error entered in the Preliminary Amendment filed after the present application was filed.

No new matter is added.

REMARKS

The present application describes a process for reacting a piperidone with gaseous hydrogen chloride to ketalize the piperidone. Applicants disclose on page 1 of the present specification that although the formation of ketals from a piperidone such as triacetoneamine has been reported before, the prior art processes are carried out by using a reactant in its aqueous form or by using an organic acid such as p-toluenesulfonic acid.

Certain disadvantages inhere to processes carried out by using aqueous inorganic acids or organic acids. For example, the amine portion of the piperidone may convert to a salt form thus absorbing substantial amounts of the acid catalyst. When this happens, each mole of the reactant absorbs one mole of the catalyst and thus a substantially greater than a catalytic amount of the acid is required.

The advantages of carrying out the ketalization of piperidone as presently claimed are described in the present specification on page 5, line 25 through page 6. Such advantages include a reduced amount of hydrogen chloride usage, reduced waste, improved yield of the desired product, reduced by-product formation, reduced reaction time, and simplification of purification.

The Examples of the present specification show that high product yields are achievable when gaseous HCl is used in combination with non-polar solvents. Examples 1-4 of the present specification provide yields of the desired product which are 76% and greater.

The drawbacks of using an aqueous-type acid which may form a salt of a piperidone are well-demonstrated by Naohiro. Control 1-1 in column 4 of Naohiro describes the reaction of a hydrogen chloride form of triacetoneamine. In Control 1-1, the hydrochloride form of triacetoneamine (e.g., the salt form) is reacted in the presence of the organic acid p-toluenesulfonic acid to form a ketal. The product yield obtained for the Control Examples and the Inventive Examples of Naohiro are described in Table 1 in columns 5-6. As is

readily evident from Table 1 of Naohiro, the reaction of the salt form of the triacetoneamine provides a very low product yield (i.e., no greater than 47%).

Examples 1-1 through 1-8 of Naohiro show the effect of using a polar solvent when p-toluenesulfonic acid is used as a catalyst. These Examples show that yields of 84-94% are achievable when a polar solvent is used in combination with p-toluenesulfonic acid. Present Claim 3 requires the use of a solvent such as an acyclic hydrocarbon, a cyclic hydrocarbon, or an aromatic hydrocarbon that is different from the polar solvents of Naohiro.

Applicants submit that the Control Examples of Naohiro provide evidence that carrying out a ketalization process in the presence of an aqueous acid so that a salt form of the triacetoneamine is formed as an intermediate, provides a lower purity product in lower yield.

Moreover, the examples of Naohiro do not provide any indication that the form of the triacetoneamine may have an effect on the reaction. In fact, Naohiro's Table 1, at best, shows only that the choice of solvent may effect the reaction. Naohiro does not recognize that the form of the triacetoneamine (e.g., salt form or base form) may have an effect.

The Office asserts that the presently claimed invention is obvious over Naohiro in view of Buzzard (WO 02/22593). The Office appears to be aware that present independent Claim 1 requires that the reacting (i.e., the reaction of triacetoneamine with a hydroxyl derivative) is carried out in the presence of gaseous hydrogen chloride. The Office concedes that Naohiro does not disclose this aspect of the presently claimed invention (see the first full paragraph on page 3 of the January 8, 2007 Office Action). To remedy this deficiency, the Office relies upon Buzzard as evidence that it would be obvious to carry out a reaction using gaseous HCl.

At the outset, Applicants point out that the reactions of Naohiro and Buzzard are substantially different. Naohiro discloses the reaction of a piperidone with an alkanediol

compound (see columns 7 and 8 of Naohiro) whereas Buzzard discloses the conversion of pentose or pentosan to furfural. Applicants submit that the reactions of Buzzard and Naohiro are substantially different. Naohiro discloses a reaction that is carried out on a six-membered heterocyclic ring whereas Buzzard discloses a reaction carried out on a five-membered carbon ring. Structures of triacetoneamine and furfural obtained from www.sigmaaldrich.com are attached herewith for convenience.

It appears that the Office did not consider this difference between the reactants of Naohiro and Buzzard and provided no basis for asserting that the reactivity of a five-membered carbon ring would be applicable to the reactivity of a six-membered heterocyclic ring.

The six-membered heterocyclic ring of Naohiro includes an N atom. The N atom may be substituted with a R₄ group which may be a hydrogen atom or an alkyl group (see column 7, line 55). Applicants submit that when reacted with gaseous HCl such an N group-containing moiety would react in a substantially different manner than the five-membered carbon ring of Buzzard. For example, an amine group such as the amine group of the piperidone of Naohiro forms an HCl salt when exposed to or reacted with HCl. A salt form of the prior art starting material may have substantially different reactivity in comparison to the Naohiro starting material. A change to the salt form may provide a compound that is substantially different than the six-membered N atom group-containing starting material of the present claims.

Applicants submit that the Office provided no rational basis for combining the above-cited prior art. Because the reactants of Naohiro and Buzzard are so different and because the reactant of Naohiro would be expected to undergo different types of reactivity the combination of the prior art references is not proper. For at least this reason the rejection should be withdrawn and the claims should be allowed.

Not only are the starting materials and products of Naohiro and Buzzard different, the conditions under which the reactions carried out are also substantially different. Naohiro discloses that the reaction of the prior art six-membered heterocyclic ring is carried out “in the presence of a polar solvent” (column 3, lines 12-13 of Naohiro). In contrast, the reaction of Buzzard is carried out by heating the prior art five-membered hydrocarbon ring in the solid phase in the presence of a gaseous acid catalyst (see page 2, lines 12-14 of Buzzard). Further, the pentose and pentosan of Buzzard are solid materials whereas the triacetoneamine of the present claims is a liquid.

Applicants thus submit that the prior art relied upon by the Office is not properly combinable at least because (i) the starting reactants and finished products Naohiro and Buzzard are substantially different, and because (ii) the conditions of the Buzzard and Naohiro reactions are substantially different.

For the reasons discussed above, in view of the disparate starting materials, reactant conditions and final products. Applicants submit that those of ordinary skill in the art would have no basis for turning to use the disclosure of Buzzard as inspiration to modify the reaction of Naohiro. Applicants thus submit that the rejection is not supportable and should be withdrawn.

Applicants draw the Office’s attention to dependent Claim 2 which requires that the reacting is carried out in the presence of a solvent. Applicants submit that dependent Claim 2 is further patentable in view of the combination of Buzzard and Naohiro.

As already discussed above, and as conceded by the Office, Naohiro does not disclose at least one feature of the presently claimed invention; namely, carrying out the reaction with gaseous hydrogen chloride. With respect to dependent Claim 2, Applicants note that the reaction of Buzzard is carried out by reacting a solid reactant with gaseous HCl. Applicants submit that it makes no sense to reject Claim 2 over Naohiro and Buzzard in view of the fact

that Buzzard explicitly states that the prior art reacting is carried out in the solid state.

Applicants submit a reaction carried out in the solid state cannot render obvious a reaction carried out in the presence of a solvent. Thus, dependent Claim 2 is further patentable over the combination of Buzzard and Naohiro.

With regard to present dependent Claim 3 which requires that the reaction is carried out in a solvent selected from the group that includes an acyclic hydrocarbon, a cyclic hydrogen carbon and an aromatic hydrocarbon, Applicants submit that the aforementioned subject matter is further patentable in view of the fact that Naohiro requires that the prior art reacting is carried out “in the presence of a polar solvent selected from the group consisting of alcohols having 1 to 13 carbon atoms and 1 alcoholic hydroxyl group, and amides of carboxylic acids having 1 to 4 carbon atoms” (see column 8, lines 34-38 of Naohiro).

Applicants also draw the Office’s attention to dependent Claim 4 where the solvent is heptane, cyclohexane, ethylcyclohexane, toluene or xylene. Applicants submit that the subject matter of Claims 3 and 4 is further patentable over the combination of Buzzard and Naohiro in view of the fact that (i) Naohiro requires the presence of a polar solvent that has a hydroxyl or acidic group and (ii) Buzzard discloses a reaction that is carried out by contacting a reactant in the solid state with a second, gaseous material. Applicants therefore submit that the rejection of Claims 3 and 4 in view of Naohiro and Buzzard is not supportable and should be withdrawn.

For the reasons discussed in detail above, Applicants submit that all now-pending claims are in condition for allowance and request the mailing of a Notice of Allowance acknowledging the patentability of the present claims over the prior art relied upon by the Office.


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